

Cone Penetration Testing (CPT)

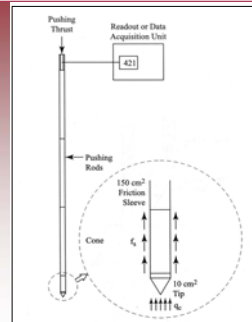
Tom's First Two Lectures:

1. What does CPT/CPTU measure? – Historical overview, CPT/CPTU in today's practice, CPT equipment and procedures, deployment systems, data acquisition.

2 CPT data processing: corrections, accuracy, data quality, standards and specifications.



Cone Penetration Testing (CPT)



Full displacement in situ test without soil sampling

Cylindrical probe (10 or 15 cm²) with 60° tip

Push method of deployment typically at ≈ 2 cm/s

Test results are used to evaluate soil stratigraphy and soil properties



Cone Penetration Testing (CPT)

Standards of Reference:

American Society for Testing and Materials (ASTM):

- D3441 "Mechanical Cone Penetration Tests of Soil"
- D5778 "Performing Electric Friction Cone and Piezocone Penetration Testing of Soils"
- D6067 "Using the Electric Cone Penetrometer for Environmental Site Characterization"

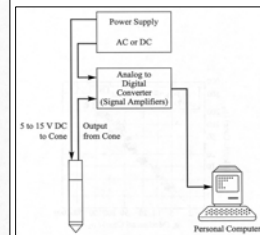
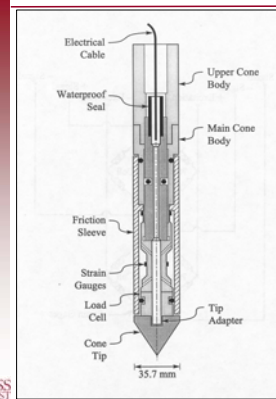
International Standard (ISSMGE):

"International Reference Test Procedure for the Cone Penetration Test (CPT) and the Cone Penetration Test with pore pressure (CPTU)"



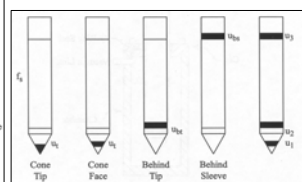
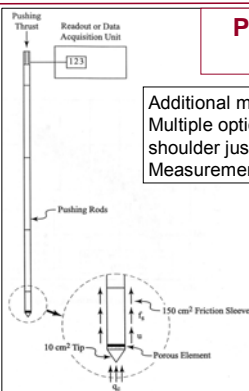
Electric Cone Penetrometer (CPT)

Strain gauge based load cells to measure tip force and sleeve force



Piezocone Penetration Testing (CPTU)

Additional measurement of pore pressure
Multiple options → most common is on the shoulder just behind the tip = u_2 .
Measurement at the tip = u_1



CPT/CPTU Deployment

Portable push frames



CPT/CPTU Deployment

Conventional Drill Rig



Flat bed truck



CPT/CPTU Deployment

Small and large size cone trucks



CPT/CPTU Field Measurements

Typical Field Measurements:

1. Cone geometry – tip area A_t (usually 10 or 15 cm^2), sleeve area A_s (usually 150 cm^2)
2. Tip force – F_t
3. Sleeve friction force – F_s
4. Pore pressure u_1 , or u_2 , etc.
5. Inclination – vertical and horizontal



CPT/CPTU Reduced Data

Tip Resistance q_c $q_c = F_t/A_t$

Sleeve friction f_s $f_s = F_s/A_s$

Friction Ratio R_f (%) $R_f = f_s/q_c$

Corrected CPTU Tip Resistance q_t $q_t = q_c + u_2(1-a)$
 (a = net area ratio)

